

Appl. No. : 10/008,763  
Filed : November 30, 2001

### AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application. In the listing, Claims 1, 13, 15, 16, 27, and 32 have been amended and Claim 31 has been canceled.

1. **(Currently Amended)** A hard disk drive comprising:
  - a rotatable disk having a magnetic recording media wherein the rotatable disk defines a plurality of concentric servo tracks;
  - a pivotable actuator that is movable with respect to the rotatable disk;
  - a transducer disposed on the actuator so as to be positioned with respect to selected ones of the plurality of concentric servo tracks;
  - a controller that controls the movement and position of the transducer with respect to the selected servo tracks;
  - a shock detection system that analyzes a signal indicative of a movement of at least a portion of the hard disk drive, ~~[[and]]~~ determines whether the hard disk drive has experienced a shock event, and provides a shock event parameter based on the signal; and
  - a shock event logger that records the shock event parameter by incrementing one of a plurality of bins based on the value of the shock event parameter ~~information about the shock event as determined~~ provided by the shock detection system.
2. **(Currently Amended)** The hard disk drive of Claim 1, wherein the shock event logger records the shock event parameter ~~information~~ to a memory.
3. **(Original)** The hard disk drive of Claim 2, wherein the memory is a non-volatile memory.
4. **(Original)** The hard disk drive of Claim 3, wherein the non-volatile memory is a semiconductor memory.

5. **(Original)** The hard disk drive of Claim 3, wherein the non-volatile memory is a portion of the rotatable disk.

6. **(Original)** The hard disk drive of Claim 1, wherein the shock detection system comprises a shock sensor signal processor that analyzes a signal from a shock sensor.

7. **(Original)** The hard disk drive of Claim 6, wherein the shock sensor is an accelerometer that measures linear acceleration.

8. **(Original)** The hard disk drive of Claim 6, wherein the shock sensor is an accelerometer that measures rotational acceleration.

9. **(Original)** The hard disk drive of Claim 6, wherein the shock sensor comprises accelerometers that measure both linear and rotational accelerations.

10. **(Original)** The hard disk drive of Claim 1, wherein the shock detection system comprises a back-emf signal processor that analyzes a back-emf signal generated when the actuator moves.

11. **(Original)** The hard disk drive of Claim 1, wherein the shock detection system comprises a position error signal processor that analyzes the position error signal indicative of a position deviation of the transducer from a reference position.

12. **(Original)** The hard disk drive of Claim 11, wherein the position error signal processor determines that a shock event has occurred when the position error signal exceeds a predetermined threshold value.

13. **(Currently Amended)** A hard disk drive comprising:

a rotatable disk having a magnetic recording media wherein the rotatable disk defines a plurality of concentric servo tracks;

a pivotable actuator that is movable with respect to the rotatable disk;

a transducer disposed on the actuator so as to be positioned with respect to selected ones of the plurality of concentric servo tracks;

a controller that controls the movement and position of the transducer with respect to the selected servo tracks;

a shock detection system that analyzes a signal indicative of a movement of at least a portion of the hard disk drive and determines whether the hard disk drive has experienced a shock event;

a shock event logger that records information about the shock event as determined by the shock detection system;~~and~~

wherein the shock detection system comprises a position error signal processor that analyzes the position error signal indicative of a position deviation of the transducer from a reference position and determines that a shock event has occurred when the position error signal exceeds a predetermined threshold value of approximately 32% of a track width; and

wherein the shock event logger records the position error signal by incrementing one of a plurality of bins based on the value of the position error signal.

14. (Original) The hard disk drive of Claim 12, wherein the shock event logger records the position error signal to the non-volatile memory.

15. (Currently Amended) A hard disk drive comprising:

a rotatable disk having a magnetic recording media wherein the rotatable disk defines a plurality of concentric servo tracks;

a pivotable actuator that is movable with respect to the rotatable disk;

a transducer disposed on the actuator so as to be positioned with respect to selected ones of the plurality of concentric servo tracks;

a controller that controls the movement and position of the transducer with respect to the selected servo tracks;

a shock detection system that analyzes a signal indicative of a movement of at least a portion of the hard disk drive and determines whether the hard disk drive has experienced a shock event;

a shock event logger that records information about the shock event as determined by the shock detection system; and

wherein the shock detection system comprises a position error signal processor that analyzes the position error signal indicative of a position deviation of the transducer from a reference position and determines that a shock event has occurred when the position error signal exceeds a predetermined threshold value; and

wherein the shock event logger records position error signals corresponding to a plurality of shock events by incrementing one of a plurality of bins based on the value of the position error signal, the position error signal being recorded in a ~~in a sequential manner to the~~ non-volatile memory.

16.-17. (Canceled)

18. (Previously Presented) A hard disk drive comprising:

a rotatable disk having a magnetic recording media wherein the rotatable disk defines a plurality of concentric servo tracks;

a pivotable actuator that is movable with respect to the rotatable disk;

a transducer disposed on the actuator so as to be positioned with respect to selected ones of the plurality of concentric servo tracks;

a controller that controls the movement and position of the transducer with respect to the selected servo tracks;

a shock detection system that analyzes a signal indicative of a movement of at least a portion of the hard disk drive and determines whether the hard disk drive has experienced a shock event;

a shock event logger that records information about the shock event as determined by the shock detection system; and

wherein the shock detection system comprises a position error signal processor that monitors an elapsed time taken for the position deviated transducer to return to and maintain a position within a reference window for a predetermined time, wherein the position error signal processor determines that a shock event occurred when the elapsed time exceeds a predetermined duration.

19. **(Original)** The hard disk drive of Claim 18, wherein the predetermined duration is the time taken for a predetermined number of wedge-to-wedge time intervals encountered by the transducer, wherein the wedge-to-wedge time interval represents a unit of time that depends on the rotational speed of the disk and the number of servo wedges per servo track.

20. **(Original)** The hard disk drive of Claim 19, wherein the predetermined duration is 100 wedge-to-wedge time intervals.

21. **(Original)** The hard disk drive of Claim 19, wherein the predetermined duration is 300 wedge-to-wedge time intervals.

22. **(Original)** The hard disk drive of Claim 19, wherein the predetermined duration is 500 wedge-to-wedge time intervals.

23. **(Original)** The hard disk drive of Claim 18, wherein the shock event logger records the elapsed time to the non-volatile memory.

24. **(Original)** The hard disk drive of Claim 23, wherein the shock event logger records elapsed times corresponding to a plurality of shock events in a sequential manner.

25. **(Original)** The hard disk drive of Claim 23, wherein the shock event logger records the number of shock events in an incremental register.

26. **(Original)** The hard disk drive of Claim 23, wherein the shock event logger records a histogram of the elapsed time, wherein the histogram represents a plurality of shock events.

27. **(Currently Amended)** A method of logging shock events in a hard disk drive comprising a rotatable disk having a magnetic recording media, the method comprising:

**providing a shock event logger housed within the hard disk drive;**

monitoring a signal from a component of the hard disk drive that responds to at least one of displacement, velocity, or acceleration of at least a portion of the hard disk drive;

evaluating the signal to determine whether the at least one of displacement, velocity, or acceleration is a result of a shock event;

**providing a shock event parameter based on the signal to the shock event logger;** and

**incrementing one of a plurality of bins based on the value of the shock event parameter.**~~recording information about the shock event.~~

28. **(Currently Amended)** The method of Claim 27, wherein ~~incrementing~~ recording comprises ~~logging of information about the shock event to~~ **incrementing one of a plurality of bins in** a non-volatile memory.

29. **(Original)** The method of Claim 28, wherein logging to the non-volatile memory comprises logging to a semiconductor memory.

30. **(Original)** The method of Claim 28, wherein logging to the non-volatile memory comprises logging to a portion the rotatable disk.

31.-33. **(Canceled)**

34. **(New)** The hard disk drive of Claim 1, wherein the shock event parameter is a position deviation of the transducer.

**Appl. No.** : **10/008,763**  
**Filed** : **November 30, 2001**

35. (New) The hard disk drive of Claim 1, wherein the shock event parameter is a duration of the shock event.

36. (New) The hard disk drive of Claim 1, wherein the shock event parameter is a time of the shock event.

37. (New) The method of Claim 27, wherein the shock event parameter is a position deviation of a transducer of the hard disk drive.

38. (New) The method of Claim 27, wherein the shock event parameter is a duration of the shock event.

39. (New) The method of Claim 27, wherein the shock event parameter is a time of the shock event.